

Our Team at the University of Notre Dame

Computer Science and Engineering



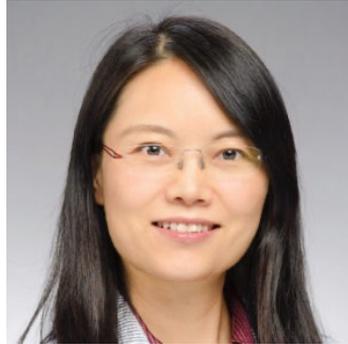
Meng Jiang

Natural Language Processing (NLP)



Nitesh Chawla

Data Science & Artificial Intelligence



Xiangliang Zhang



Toby Li

Human Computer Interaction (HCI)

Psychology



James R. Brockmole

Cognition, Brain, and Behavior

Director

Lucy Family Institute for Data and Society

Sociology



Simone Zhang

Social implications of technologies

REASON



Query
information

+



(Classified and unclassified)
information sources

analyze, search, analyze, search ...



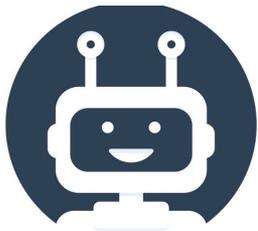
Analyst

write



Analytic
report

help



Intelligent
assistant

Representation and indexing: Meng

Dense passage retriever (DPR) vs Sparse models

Reasoning with multimodal data: Nitesh/Xiangliang

Cross-modal interaction and fusion

Reasoning with heterogeneous knowledge (K):

Meng/Xiangliang Neural-symbolic & Knowledge graphs of commonsense K, world K, domain K

Interactive & interpretable reasoning with

analyst feedback: Toby / Meng

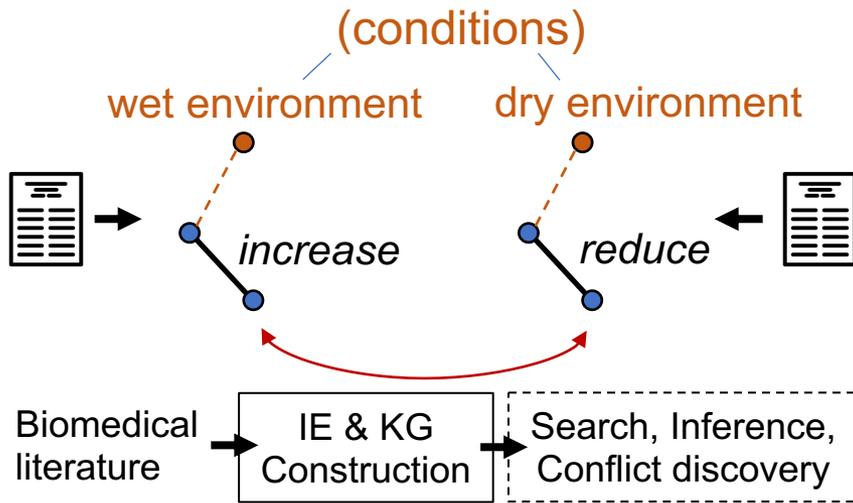
Personalized & cooperative assistance: Nitesh /

Meng / sociologists / psychologists

Compatible with analyst comprehension skills

Past / Current Project Samples

Conditions in Claims & Evidence



Published in top data mining / NLP conferences and top computational biology journals (**KDD, EMNLP, TCBB**)

Uncertain Judgement

Requirements Traceability Matrix

Requirement	Test case	References	Reliability
...	...		



Received ACM SIGSOFT **Distinguished Paper Award** in International Conference on Software Engineering 2021

Evidence Extraction in Intelligent Quiz Design



assisting teachers

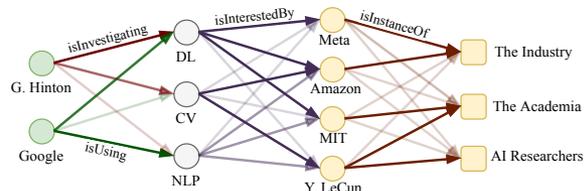
assisting students

Question: ... ?
 A) ... B) ... C) ... D) ...
 Answer: B.
 Explanation: ...
 Evidence: ...



Funded by National Science Foundation Research on **Emerging Technologies for Teaching and Learning (RETTL)** Program

Reasoning on Graphs



Multi-hop Logical Query

Entity-level
ABox Answers

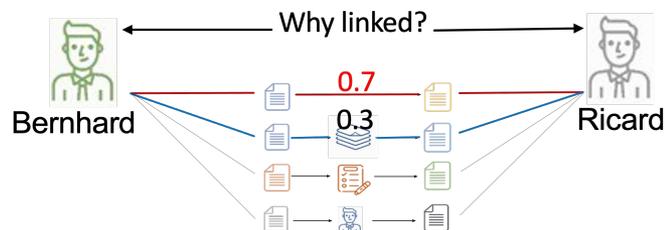
Concept-level
TBox Answers

$\exists ? : \{((G.Hinton \xrightarrow{\text{isInvestigating}}) \wedge (Google \xrightarrow{\text{isUsing}})) \xrightarrow{\text{isInterestedBy}}\} (?)$

Neural logical reasoning on knowledge graphs:

- Organize entity relations by graphs
- Model multi-hop relations
- Find matchable answers to logical queries

Interpreting Decision-Making on Graphs

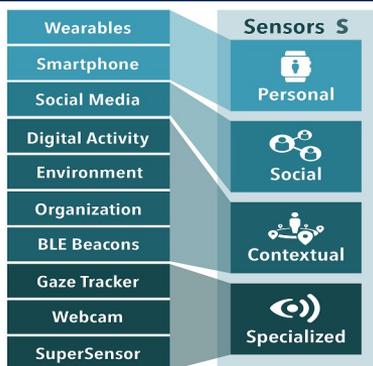


Interpreting the decision-making process on heterogenous graphs

- Make node-/graph-level predictions
- Search for the evidence
- Quantify contributing factors

[WSDM 2022,
WSDM 2023]

Project Tesserae: Understanding Job Performance through Low-cost Sensing Fusion



Capture large cohorts longitudinally to sense life events through a rich suite of sensors.

Jointly model mental state, behavior, social interactions, and context.

Utilize machine learning to **integrate heterogeneous data streams.**

IAPPA funded.
Collaboration among CSE,
Psychology, and Sociology.

Human-AI Collaborative Systems

Interaction mechanisms to support human's:

- understanding and verification of ML model's learning
- continuous involvement of themes and interpretations in subjective, ambiguous, and abstract textual data

Collaboration among Data Science, AI, and HCI.